

In referring to the construction which must follow criticism, Mr. Sedgwick says:—

"That is the task of the great band of workers in many departments of Biology, who, undeterred by failure and urged on by the fire, enthusiasm, and generous aspirations of youth, return time after time, generation after generation, to the assault of the fortresses of nature well knowing that their material reward will be small, that defeat means the world's neglect and that success, except the greatest, brings but a pittance of its esteem. To them I inscribe this book in the hope that it may serve if only to a small extent to smooth over the difficulties of part of the road which at first they have to travel."

We may be allowed to thank the author for doing more than "smooth over" the difficulties of the road on which all students of zoology have to travel, for he has cleared away many hindrances and pointed out many pitfalls. It would serve little purpose, however, to enter into any discussion of the numerous morphological problems in regard to which Mr. Sedgwick has made some personal and luminous contribution. We feel that we have not said enough in regard to the excellence of his workmanship, but praise of what is masterly is gratuitous. The book's scholarliness, clearness, and carefulness of statement are obvious, but those who work with it will discover other virtues—a suggestive scepticism, a mature judgment, and a more undefinable quality which we can only hint at in the phrase "morphological insight."

AN ESSAY IN HISTORICAL CHEMISTRY.

The Study of Chemical Composition: an Account of its Method and Historical Development. By Ida Freund. Pp. xvi+650. (Cambridge: The University Press.)

MISS FREUND is to be congratulated on having written a very interesting book. It is true that her subject-matter is to be found in many other quarters; she has really written a historical treatise on what is generally called stoichiometry; but having chosen as her title "*The Study of Chemical Composition*," she has left herself, so to speak, unfettered, and has been able to write somewhat more discursively than if she had compiled a treatise. Indeed, in the preface to the work she confesses:—

"Although anxious to trace separately the *historical development* in the discovery and in the establishment of certain laws and classes of phenomena, I have made no attempt to produce anything sufficiently complete or even sufficiently proportioned to deserve the name of *history*. I have preferred to deal in greater detail with a few researches, especially such as I could repeatedly utilise from various points of view, than to treat a greater number more cursorily, believing in what Lavoisier said more than a century ago that 'in such matters as these, the choice of proofs is more important than their number.'"

The result is a fairly full, indeed in some instances a very full, account of classical researches in the sphere to which she has confined her attention; the only omission is that of all reference to the laws of dilute solutions, and in this she was guided by the

fact that the subject has been recently fully treated in many works which are easily accessible.

Beginning with a sketch of the method of the inductive sciences, quotations from Bacon, Jevons, Kant, Whewell, and Mill are introduced, with illustrations of deductive reasoning by Kepler, Lavoisier, Davy and others, having as its basis classification, generalisation, and law. Next follows a fairly detailed study of the phlogistic theory, giving an excellent summary of the views held by the phlogistonists. Here Cavendish's reasons for his choice of the terminology of the phlogistic theory might with advantage have been inserted. Examples of Lavoisier's and Stas's work, and of Morley's synthesis of water are given to illustrate the basis on which the doctrine of the "conservation of mass" is founded. But laws may be of two kinds, exact and approximate; the difference is illustrated by Boyle's law and van der Waals's improved form. We do not notice, however, the remark that van der Waals's formula itself is only a rough approximation to the expression of the behaviour of gases under high pressures. Landolt's experiments, which may be now accepted as a proof of the accuracy of the constancy of mass, are cited; the reviewer does not know if Landolt has published the fact that his doubts disappeared only after he had used silica instead of glass vessels.

Affinity is the subject of the next historical sketch; here the views of Bergmann and Berthollet are very well summarised; and this naturally leads to the conception of fixed ratios by Proust, and the succeeding work of Dalton and Berzelius, with reference to the ideas contended for by Laurent.

The author now harks back to theories of matter, taking up the subject at its earliest start in India and Greece. The speculations of Bacon, Descartes, Gassendi, and Boyle are described, generally in their own words. Next follows a full account of Dalton's atomic hypothesis, of Gay-Lussac's law of volumes, and of Avogadro's generalisation. Berzelius's attitude towards the rival views is explained, and a clear account is given of the veteran Cannizzaro's successful attempt to obtain full recognition of the justice of Avogadro's views, so long overlooked. The determination of atomic weight by means of specific heat, and an excellent account of Mitscherlich's work and its latest development by Retgers (this last, so far as the reviewer knows, has not previously been accessible except in original papers), complete this part of the subject. The periodic arrangement of the elements, and its bearing on the determination of atomic weights, leads naturally to a consideration of the doctrine of valency, and Miss Freund has not omitted to state the attempts which have been made to represent valency in terms of the electronic theory. A chapter on isomerism follows, and the concluding chapter treats of the constitution of matter and the genesis of the elements.

From this sketch it will be seen that Miss Freund has brought together, in a compact form, a great deal of interesting matter. She has quoted freely from the authors whose views she presents, and, on

the whole, with great judgment. The work is professedly a compilation, but it is a compilation by one who knows the subject. It would perhaps have been too much to expect that independent opinion on the many matters discussed should have been expressed, but we are at least put in possession of many views in an interesting and readable form. The work should be read by all advanced students of chemistry.

W. R.

THE KEW INDEX OF FLOWERING PLANTS.

Index Kewensis Plantarum Phanerogamarum; Supplementum Secundum, nomina et synonyma omnium generum et specierum ab initio anni MDCCCXCVI usque ad finem anni MDCCCC complectens. Ductu et consilio W. T. Thiselton-Dyer confecerunt herbarii horti regii botanici Kewensis curatores. Leucocoryne-Zygostates et emendanda addenda. Pp. 105-204. (Oxford: Clarendon Press, 1905.) Price 12s. net.

THE second and concluding part of supplement ii. of the "Index Kewensis" follows quickly on the first. This means that we now have a list of the names and synonyms of genera and species of flowering plants published from the foundation of binominal nomenclature to the end of 1900 complete except for a serious gap in supplement i. representing the last third of the alphabet for the years 1886-1895. Three parts of the first supplement appeared between September, 1901, and November, 1903; the fourth is therefore much overdue. Its delay is the more to be regretted as the period with which it is concerned was one of considerable activity in systematic botany, including, for example, the great development of the Berlin school under Dr. Engler's direction. It is to be hoped that the completion of this portion of the work, for which Kew is not responsible, will soon be announced.

The best way to appreciate the Kew index is to call to mind the time before its appearance, when getting at the origin of a name meant often a long book-hunt, and sometimes a remarkable revelation of the wonderful and remote places in which it was possible to publish names, such, for instance, as the Melbourne *Chemist and Druggist*, in which, if we remember rightly, some species were published by the late Baron von Mueller. These literary researches were often extremely interesting, but they were not botany, and a failure by some botanists to realise their importance often caused worry and inconvenience to subsequent workers. In passing, we may note a feature of the index to which reference was made at the conference on nomenclature at Vienna last June. It was pointed out that the list of names of genera which a large majority of members agreed must be retained, even though they were not the earliest published names, departed very little from the names recognised in the index—it might even have been possible to have taken the index as a starting point.

The present number makes quite interesting reading, for it marks in a striking way the progress of systematic botany during the five years under con-

sideration. Africa, especially tropical Africa, has afforded much material for work, as evidenced by parts of the Kew Floras, the catalogue of Dr. Welwitsch's Angolan plants, and other publications in this country; and the numerous papers on African botany issued from Berlin. The completion of the "Flora of British India" is chronicled by numerous citations in various genera of grasses; and there is also ample indication of the activity of North American botanists in working out their flora. Here and there is evidence of an important monograph, as that of Bromeliaceæ by Dr. Mez, or of Monimiaceæ by Miss Perkins, in a list of new species, combinations or reductions. Some entries under a quaint or unfamiliar name form a record of antiquarian research and love of priority; such, for instance, are those under Sitanion, a name of Rafinesque which antedates the well known Elymus; these names are promptly reduced to synonymy. It is, however, not always so easy to follow the reductions. For instance, American botanists seem generally agreed that *Lewisia*, a genus founded by Pursh, must be restored for certain species of *Calandrinia*; but the index quotes them only as synonyms, referring them back to *Calandrinia*. In looking down the columns one is struck by the large number of personal species-names, which seems to indicate a want of imagination on the part of some authors; thus nineteen out of forty-two new species of *Polygala*, and thirteen of twenty-two of *Lissochilus*, have names recalling the person who first collected or was in some way or other associated with the plant. A few omissions might be noted, though that has probably been done already by those concerned. A curious citation is given, under *Peperomia* and *Panicum*, of two species from Dr. Andrews's Christmas Island monograph.

In conclusion, we would express the hope that the record of the next five years, now nearly ended, may be available at as short an interval as possible.

A. B. R.

OUR BOOK SHELF.

Sugar and the Sugar Cane. By Noël Deerr. Pp. viii+395+xix. (Altrincham: Norman Rodger, 1905.) Price 7s. 6d. net.

So many effects have already been ascribed by politicians and journalists to the Brussels Sugar Convention, that one hesitates to add to its account the recent large output of sugar-cane literature in this country, but there can be little doubt that the brighter prospects which the Convention seemed to promise sugar-cane planters has encouraged publication on this subject, and hence the issue, within the comparatively short space of three years, of four books, in English, dealing with the cultivation of the sugar cane or of the production of sugar therefrom.

There was, of course, much leeway to make up, since the interesting and important results achieved during recent years as the result of the cultural experiments carried on in British Guiana, the West Indies, Mauritius, Hawaii, Java, Queensland, India, and elsewhere were for the most part only available in the uninviting form of Government reports, and similarly there existed no general and concise account of the improvements recently brought about in the machinery used in sugar factories.